



Europäisches Patentamt  
European Patent Office  
Office européen des brevets

Publication number:

**0 150 385**  
**A2**

12

## EUROPEAN PATENT APPLICATION

21 Application number: 84115259.8

51 Int. Cl.: **D 06 N 5/00, D 06 N 7/00**

22 Date of filing: 12.12.84

30 Priority: 19.12.83 US 562800

71 Applicant: **GENERAL ELECTRIC COMPANY, 1 River Road, Schenectady New York 12305 (US)**

43 Date of publication of application: 07.08.85  
Bulletin 85/32

72 Inventor: **Modic, Frank Joseph, 6 Lillian Drive, Scotia New York 12302 (US)**

84 Designated Contracting States: **BE DE FR GB NL**

74 Representative: **Schüler, Horst, Dr. European Patent Attorney et al, Kaiserstrasse 41, D-6000 Frankfurt/Main 1 (DE)**

54 **Organosiloxane fabric coating compositions.**

57 A method for imparting improved tear strength and improved flame retardance to a base fabric material comprising applying to at least one side of said base fabric material a base silicone coating composition containing an amount of non-abrasive filler effective for imparting tear strength and flame retardance.

**EP 0 150 385 A2**

ORGANOSILOXANE FABRIC COATING COMPOSITIONSBackground of the Invention

Reference is made to copending German patent applications  
P 34 23 770.4 and P 34 23 742.9, \_\_\_\_\_  
\_\_\_\_\_ assigned to the same assignee as the  
present invention.

The present invention relates to coated fabrics having  
improved strength and improved flame retardance. More  
particularly, the present invention relates to a method for  
improving the strength and flame retardance of silicone coated  
glass cloth by incorporating non-abrasive fillers such as  
calcium carbonate, hydrated alumina and the like into the  
elastomeric silicone coating.

The discovery that Teflon <sup>®</sup> coated fiberglass could be  
utilized as a noncombustible, durable roof structure has  
initiated a transformation from simplistic, temporary  
air-supported structures to one with evergrowing potential.  
The impetus for the development of such fabric membrane  
structures was to provide roofing for large sports facilities.  
This led to other roofing uses such as for department stores,  
shopping malls, schools, exhibition buildings, industrial  
structures and the like. While the Teflon-coated fiberglass  
system has many desirable features such as durability and dirt  
resistance, it suffers from the major deficiency that light  
(solar) transmission is limited to approximately 10 to 15% due  
to the opaqueness of Teflon.

1                   Modic, in copending German applications P 34 23 770.4  
                  and P 34 23 742.9, ————— provided roofing fabric  
5                   membrane structures which overcome the light transmission  
                  problem of the Teflon-coated fiberglass system by utilizing a  
                  transparent or translucent base coating and a transparent or  
                  translucent dirt resistant coating. Modic further taught that  
                  a finely divided inorganic filler could optionally be included  
10                   in the silicone coatings in order to adjust the translucency of  
                  the coated fiberglass fabric. The extent to which light  
                  transmission is reduced is determined by the quantity of filler  
                  utilized, i.e. more filler reduces the amount of light which  
                  passes through to the interior of the building or structure.  
                  Modic also taught that since the function of the finely divided  
15                   filler is not to reinforce the composition, reinforcing fillers  
                  are generally not employed.

                  It has recently been found that the tear strength of the  
                  coated fabric was about the same or less than that of the  
20                   original uncoated fabric when ground quartz such as Minusil ®  
                  was employed as a filler on a fiberglass cloth. Quite  
                  unexpectedly, the present applicant has discovered that when  
                  certain non-abrasive fillers such as calcium carbonate and  
                  hydrated alumina are added to the base silicone coating  
25                   composition, the tear strength of the coated fabric  
                  significantly increases. Moreover, the inclusion of such  
                  non-abrasive fillers in the silicone coatings surprisingly  
                  improves the flame retardance or flame resistance of the coated  
                  fabric.

1

Summary of the Invention

5

It is one object of the present invention to provide fabric membrane structures which exhibit improved tear strength and flame retardance.

10

Another object of the present invention is to provide a method for improving tear strength and flame retardance of silicone coated fabric membrane structures.

In accordance with the present invention there is provided a fabric membrane structure comprising:

15

(a) a base fabric material;

20

(b) a base silicone coating composition containing an amount of a non-abrasive filler effective for imparting improved tear strength and improved flame retardance to the said fabric membrane structure, and

(c) optionally, a coating composition which is resistant to dirt pickup.

25

In accordance with another aspect of the present invention there is provided a method for imparting improved tear strength and flame retardance to fabric membrane structures comprising:

30

(a) applying to at least one side of a base fabric material a base silicone coating composition containing an amount of non-abrasive filler effective for imparting improved tear strength and improved flame resistance to said fabric membrane structure, and

1  
5 (b) optionally, applying to at least one side of said base fabric material coated with said base silicone coating composition, a coating composition which is resistant to dirt pickup.

Description of the Invention

10 A preferred embodiment of the present invention provides a roofing fabric membrane structure having improved tear strength and improved flame retardancy comprising:

(a) a base fabric material;

15 (b) a silicone base coating composition containing an amount of non-abrasive filler effective for imparting improved tear strength and improved flame retardance to said roofing fabric membrane structure, and

20 (c) optionally, a coating composition which is resistant to dirt pickup.

25 In another aspect of the present invention there is provided a method for imparting improved tear strength and flame retardance to roofing fabric membrane structures comprising:

30 (a) applying to at least one side of a base fabric material a base silicone coating composition containing an amount of non-abrasive filler effective for imparting improved tear strength and improved flame resistance to said roofing fabric membrane structure, and

1

5

(b) optionally, applying to at least one side of said base fabric material coated with said silicone base coating composition a coating composition which is resistant to dirt pickup.

10

15

20

The base fabric material can be any suitable composition. It may be made from a natural fiber such as cotton, a synthetic fiber such as polyester, nylon or glass fabric, or mixtures of such fibers, depending on the properties which are desired for the base fabric. Cotton constructions are easily dyed, absorb moisture and withstand high temperatures without damage. Polyester produces fibers that are smooth, crisp and resilient, and since moisture does not penetrate polyester, it does not affect the size or shape of the fiber. Nylon is the strongest of the commonly used fibers and it is both elastic and resilient so that articles made with nylon will return to their original shape. Nylon fibers are smooth, very nonabsorbent and will not soil easily. Glass fibers offer very low elongation and very high strength and hence are particularly useful for roofing fabric membrane structures.

25

30

The base fabric material construction can be of any suitable type such as woven, knitted or nonwoven. Woven fabrics have three basic constructions: the plain weave, the twill weave and the satin weave. The plain weave is by far the strongest because it has the tightest interlacing of fibers and, accordingly, is used most often. Woven nylon or heavy cotton are typically utilized for making tarpaulin substrates and the like.

1

Knitted fabrics are used where moderate strength and considerable elongation are required. Of course, when the polymeric base coating, discussed in greater detail hereinbelow, is put on such a knit fabric, the stretch properties are somewhat reduced.

5

10

15

20

Nonwoven textile fabrics are porous, textile-like materials composed primarily of fibers and are manufactured by processes other than spinning, weaving, knitting or knotting. A few basic elements can be varied and controlled to produce a great range of nonwoven fabric materials. These include the fibers, including chemical types and physical variations; the web and the average geometric arrangement of its fibers as predetermined by its method of forming and subsequent processing; the bonding of the fibers within the web and reinforcements. In practice, each element can be varied and, thus, can exert a powerful influence, alone and in combination, on the final fabric properties. For an excellent discussion of nonwoven textile fabrics the reader is referred to the Encyclopedia of Chemical Technology, Vol. 16, Kirk-Othmer (John Wiley and Sons, 1981), pages 72-124.

25

30

Included within the definition of base fabric material are suitable laminated and reinforced plastics. Reinforced plastics are combinations of fibers and polymeric binders or matrices that form composite materials. Preferably, good adhesion exists between the fibers and the binder rather than merely a mechanical fit without adhesion. For further information, the reader is referred to the Encyclopedia of Chemical Technology, Vol. 13, Kirk-Othmer (John Wiley and Sons, 1981), pages 968 - 977.

1

Experience thus far has been that fiberglass fabric is particularly preferred as the base fabric material for the roofing fabric membrane structure of the present invention.

5

10

15

The base fabric material is coated with a base silicone coating composition. One example of a suitable base silicone polymer is described in U.S. Patent No. 3,457,214 to Modic, assigned to the same assignee as the present invention and incorporated herein by reference. This patent teaches how to provide transparent silicone compositions having silica filler by employing phenyl-containing polymers to adjust the refractive index of the composition. This approach, however, is not preferred where transparency is critical since the refractive index of the polymer will change with temperature and thus the transparency of the filled silicone polymer will also change.

20

25

Accordingly, it is particularly preferred that resin reinforced, addition cure silicone compositions be utilized as the base coating composition as their transparency is not affected by temperature changes. Examples of particularly preferred silicone base coating compositions are described in U.S. Patent Nos. 3,284,406 to Nelson and 3,436,366 to Modic, both of which are incorporated by reference into the instant disclosure. Other suitable base coating compositions will be obvious to those skilled in the art.

30

It should be noted that in the preferred base silicone coating compositions that the inclusion of a finely divided inorganic filler is optional as such filler is primarily useful as a means for controlling the transparency of the base

1  
polymer. In contrast to such teaching, the present applicant  
has surprisingly found that by adding an effective amount of  
5 non-abrasive filler such as calcium carbonate or hydrated  
alumina, the tear strength of the base fabric material as well  
as the flame retardance or resistance is dramatically  
improved. While calcium carbonate and hydrated alumina are the  
most preferred non-abrasive fillers within the scope of the  
present invention, other suitable non-abrasive fillers include  
10 fumed silica, aluminum silicate, potassium titanate, zirconium  
silicate, carbon black, zinc oxide, titanium dioxide, ferric  
oxide, silica aerogel, precipitated silica, calcium silicate,  
chromic oxide, cadmium sulfide, lithopone talc, magnesium oxide  
and graphite.

15  
In order to obtain improved tear strength and flame  
resistance in accordance with the present invention it is  
critical that the amount of non-abrasive filler included in the  
base silicone coating be effective for providing such results.  
20 In general, an effective amount of non-abrasive filler ranges  
from as little as 5 parts filler per 100 parts polymer in the  
base coating composition to as much as 300 or more parts filler  
per 100 parts polymer in the base coating composition. More  
preferably, there are from 20 to 100 parts non-abrasive filler  
25 per 100 parts silicone polymer and most preferably there are  
from 30 to 50 parts non-abrasive filler per 100 parts  
diorganopolysiloxane in the base polymer.

30 It should be noted that when reinforcing fillers such as  
fumed silica or precipitated silica are utilized as the  
non-abrasive filler the resulting base silicone coating  
composition has an undesirably high viscosity. This problem,

1 however, can easily be avoided by diluting the base silicone  
coating in a suitable solvent, for example, hexane, heptane,  
5 cyclohexane, cycloheptane, cyclohexene, benzene, toluene or  
xylene.

Methods of preparing suitable silicone base coating  
compositions are well known to those skilled in the art.  
10 Additionally, the methods for preparing the aforementioned base  
coating compositions of Modic and Nelson are described in their  
respective patents. Generally the base coating compositions of  
the present invention can be prepared merely by mixing the  
various components together in any desired fashion. It is  
15 often most convenient to prepare the preferred compositions in  
two separate portions or packages which are combined at the  
time the compositions are to be converted to the solid, cured,  
elastic state. In the case of the two package formulation it  
is convenient to include in the first package the vinyl  
20 chainstopped polysiloxane, the organopolysiloxane copolymer,  
the platinum catalyst and some or all of the finely divided,  
non-abrasive filler. The second package normally contains as  
its sole ingredient the organohydrogenpolysiloxane, but as a  
matter of convenience the second package can also contain a  
portion of the vinyl chainstopped polysiloxane and a portion of  
25 the non-abrasive filler. Typically the distribution of the  
components between the two packages is such that from 0.1 to 1  
part by weight of the second package is employed per 1 part by  
weight of the first package.

30 When the two package system is employed the two components  
are merely mixed in a suitable fashion and the resulting  
silicone composition applied to the base fabric material.

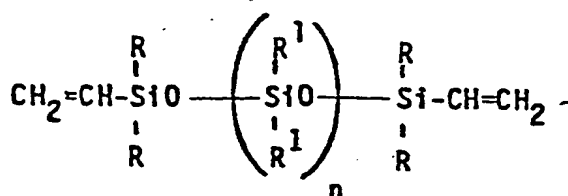
1 Various methods, such as spraying, dipping, brushing and roll  
 coating are recognized methods for applying such silicone  
 compositions to a substrate, in this case the base fabric  
 5 material.

Of course, the base silicone coating composition does not  
 necessarily have to be translucent, although this is one of the  
 primary advantages of employing a silicone base coating  
 10 composition. As Modic points out in his copending German  
 applications P 34 23 770.4 and P 34 23 742.9, \_\_\_\_\_

\_\_\_\_\_ assigned to  
 the same assignee as the present invention, one problem with  
 translucent silicone coated fabric membrane structures is that  
 15 they pick up dust or dirt upon exposure to the atmosphere.  
 Accordingly, in those instances where it is important to have a  
 translucent roofing fabric membrane structure it is desirable  
 to apply a transparent or translucent dirt resistant coating  
 over the base silicone coating composition.

20 Preferably the dirt resistant coating is a silicone  
 composition so that it is compatible with the base silicone  
 coating composition. One example of a suitable dirt resistant  
 silicone coating composition is that disclosed by Modic,  
 25 German application P 34 23 742.9, which comprises

(1) a liquid vinyl chainstopped polysiloxane having the  
 formula



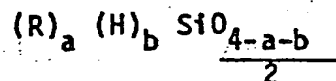
where R and R<sup>1</sup> are monovalent hydrocarbon radicals free of aliphatic unsaturation with at least 50 mole percent of the R<sup>1</sup> groups being methyl, and where n has a value sufficient to provide a viscosity up to 500 centipoise at 25°C;

(2) a resinous organopolysiloxane copolymer comprising (R<sup>2</sup>)<sub>3</sub>SiO<sub>0.5</sub> units and SiO<sub>2</sub> units, where R<sup>2</sup> is selected from the group consisting of vinyl radicals and monovalent hydrocarbon radicals free of aliphatic unsaturation, where the ratio of (R<sup>2</sup>)<sub>3</sub>SiO<sub>0.5</sub> units to SiO<sub>2</sub> units is from about 0.5:1 to about 1:1, and where from about 1.5 to about 10 mole percent of the silicon atoms contain silicon-bonded vinyl groups;

(3) optionally, a finely divided inorganic filler;

(4) a platinum catalyst; and

(5) a liquid organohydrogenpolysiloxane having the formula,



sufficient to provide from about 0.5 to about 1.0 silicon-bonded hydrogen atoms per silicon-bonded vinyl group, where R is as previously defined, a has a value of from about 1.0 to about 2.1, b has a value of from about 0.1 to about 1.0, and the sum of a and b is from about 2.0 to about 2.7, there being

1

at least two silicon-bonded hydrogen atoms per molecule.

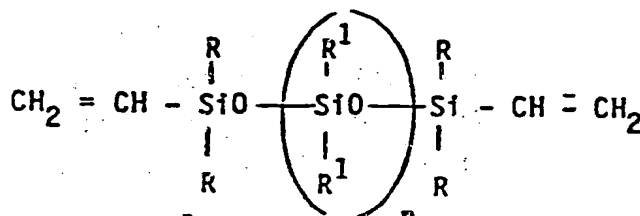
5

In another embodiment of the invention in P 34 23 742.9  
the dirt resistant silicone coating composition comprises:

10

- (1) a liquid vinyl chainstopped polysiloxane having the formula,

15



20

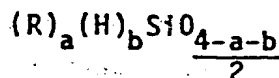
where R and R<sup>1</sup> are monovalent hydrocarbon radicals free of aliphatic unsaturation with at least 50 mole percent of the R<sup>1</sup> groups being methyl, and where n is sufficient to provide a viscosity up to 1,000 centipoise at 25°C;

25

- (2) a resinous organopolysiloxane copolymer comprising (R<sup>3</sup>)<sub>3</sub>SiO<sub>0.5</sub> units, (R<sup>3</sup>)<sub>2</sub>SiO units and SiO<sub>2</sub> units, where R<sup>3</sup> is selected from the group consisting of vinyl radicals and monovalent hydrocarbon radicals free of aliphatic unsaturation, where from about 1.5 to about 10 mole percent of the silicon atoms contain silicon-bonded vinyl groups, and where the ratio of (R<sup>3</sup>)<sub>3</sub>SiO<sub>0.5</sub> units to SiO<sub>2</sub> units is from about 0.5:1 to about 1:1 and the ratio of (R<sup>3</sup>)<sub>2</sub>SiO units to SiO<sub>2</sub> units may range up to 0.1:1

30

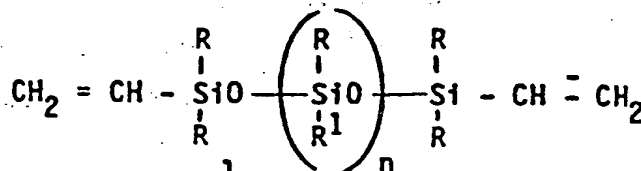
- (3) optionally, a finely divided inorganic filler;
- (4) a platinum catalyst; and
- (5) a liquid organohydrogenpolysiloxane having the formula,



sufficient to provide from about 0.5 to about 1.0 silicon-bonded hydrogen atoms per silicon-bonded vinyl group, where R is as previously defined, a has a value of from about 1.0 to about 2.1, b has a value of from about 0.1 to about 1.0, and the sum of a and b is from about 2.0 to about 2.7, there being at least two silicon-bonded hydrogen atoms per molecule.

The dirt resistant coating described in Modic, German application P 34 23 770.4, comprises

- (1) 100 parts of a liquid vinyl chainstopped polysiloxane of the formula



where R and R<sup>1</sup> are monovalent hydrocarbon radicals free of aliphatic unsaturation with at least 50 mole percent of the R<sup>1</sup> groups being methyl, and where n has a value sufficient to provide a viscosity up to about 2,000,000 centipoise at 25°C;

1

- (2) 100 to 200 parts of a resinous organopolysiloxane copolymer selected from the group consisting of:

5

10

15

- (a) resinous organopolysiloxane copolymers comprising  $(R^2)_3SiO_{0.5}$  units and  $SiO_2$  units, where  $R^2$  is selected from the group consisting of vinyl radicals and monovalent hydrocarbon radicals free of aliphatic unsaturation, where the ratio of  $(R^2)_3SiO_{0.5}$  units to  $SiO_2$  units is from about 0.5:1 to about 1:1, and where from about 1.5 to about 10 mole percent of the silicon atoms contain silicon-bonded vinyl groups; and

20

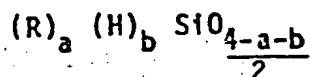
25

- (b) resinous organopolysiloxane copolymer comprising  $(R^3)_3SiO_{0.5}$  units,  $(R^3)_2SiO$  units and  $SiO_2$  units, where  $R^3$  is selected from the group consisting of vinyl radicals and monovalent hydrocarbon radicals free of aliphatic unsaturation, where from about 1.5 to about 10 mole percent of the silicon atoms contain silicon-bonded vinyl groups, and where the ratio of  $(R^3)_3SiO_{0.5}$  units to  $SiO_2$  units is from about 0.5:1 to about 1:1 and the ratio of  $(R^3)_2SiO$  units to  $SiO_2$  units may range up to 0.1:1;

30

- (3) optionally, a finely divided inorganic filler;
- (4) a platinum catalyst; and

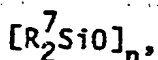
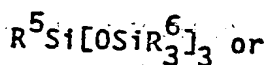
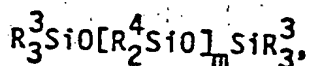
1 (5) a liquid organohydrogenpolysiloxane having the  
formula,



sufficient to provide from about 0.5 to about 1.0  
silicon-bonded hydrogen atoms per silicon-bonded  
vinyl group, where R is as previously defined, a has  
10 a value of from about 1.0 to about 2.1, b has a  
value of from about 0.1 to about 1.0, and the sum of  
a and b is from about 2.0 to about 2.7, there being  
at least two silicon-bonded hydrogen atoms per  
molecule.

15 Another suitable dust-resistant coating is provided by the  
method of Shimizu et al., U.S. Patent No. 4,395,443, which is  
also incorporated herein by reference. Briefly, Shimizu et al.  
provide a method of forming dust resistant films which  
20 comprises coating on the surface of a silicone elastomer a  
composition formed by dissolving (1) a condensation reaction  
product between (A) 100 parts by weight of a benzene-soluble  
polyorganosiloxane consisting essentially of  $SiO_2$  units and  
 $R_3^1SiO_{1/2}$  units, in which groups  $R^1$ , which may be the  
25 same or different, stand for a substituted or unsubstituted  
monovalent hydrocarbon group, wherein the amount of the  
 $R_3^1SiO_{1/2}$  units is 0.4 to 1.0 mole per mole of the  $SiO_2$   
units and a reactive group selected from hydroxyl and alkoxy  
groups is bonded to the silicon atom in an amount of 0.0004 to  
30 1 per silicon atom; and (B) 20 to 200 parts by weight of a  
silanol-terminated polydiorganosiloxane having a viscosity of  
10,000 to 2,000,000 cSt as measured at 25°C., in (2) a mixed

1 solvent comprising (a) a volatile organosilicon compound having  
a boiling point of 70 to 250°C. as measured under atmospheric  
pressure and being represented by the molecular formula:



15 in which  $R^2$  through  $R^7$ , which may be the same or  
different, stand for a hydrogen atom or an alkyl group,  $m$  is  
0 or a positive number and  $n$  is a positive number, and (b) a  
hydrocarbon solvent, the amount of the volatile organosili-  
con compound (a) being at least 5% by weight based on the  
20 total amount of the organosilicon compound (a) and the  
hydrocarbon solvent (b); and drying and curing the coated  
composition.

25 Other suitable dirt repellent coatings for use in the  
present invention will be obvious to the skilled artisan.

30 In the preferred embodiment it is contemplated that  
the roofing fabric membrane structure having improved tear  
strength and improved flame retardance will be most useful  
as a construction material in large, permanent air-supported  
or tension structures. However, owing to the versatility

1 and effectiveness of the present invention there are many  
possible uses for the roofing fabric membrane in other areas  
of the roofing industry.

5 One potential application for this type of coating is  
in the single ply roofing market. For example, one side of  
the base fabric material could be coated in the factory.  
10 When the roofing was being applied some of the silicone  
coating could also be applied on top of the urethane on the  
roof. Thereafter the coated base fabric can be rolled with  
the uncoated side down thus sealing the system together  
without the need for an adhesive.

15 Another variation would be to apply the silicone-  
coated base fabric on top of urethane boards at the factory  
so that only sealing the seams between the boards would be  
required when the roofing is installed.

20 In order to more clearly illustrate the surprising  
results of the present invention, the following examples are  
provided by way of illustration and not by way of limitation.

#### EXAMPLES

25 Example 1

30 In order to show the improvement in tear strength by  
including a non-abrasive filler in the silicone base coating  
composition the following samples were prepared. To 100  
parts of vinyl chainstopped polydimethylsiloxane having a  
viscosity of 3500 centipoise at 25°C there was added 40

1 parts of the indicated non-abrasive fillers. Also contained  
therein was 20 ppm platinum in the form of platinum octanol  
5 complex and linear hydride crosslinking agent. This base  
silicone coating composition was coated and cured on  
fiberglass base fabric material, and the tear strength of  
the coated fabric determined by the trapezoid method. The  
construction of this glass fabric was DE-75, 2/2, 24x19  
10 plain weave. The coatings were cured in an air circulating  
oven for 15 minutes at 300°F. The results are set forth in  
Table I.

15 Tear Strength of Coated Fabric  
Trapezoid Method, Federal Test Material  
Std. No. 191 -- Method 5136

TABLE I

<u>Sample</u>	<u>Filler</u>	<u>Tear Strength (lbs.)</u>
1	None	50
2	Ground quartz	35-45
3	Calcium carbonate	90-110
4	Hydrated alumina	100-150

25 Example 2

30 In this example the improvement in tear strength provided  
by the present invention is illustrated with a 5 mil heat  
cleaned glass cloth having a fine, 112 electrical grade tight  
weave. In the present example the base fabric material had a  
trapezoidal tear strength of 5 pounds. Samples of the glass  
cloth coated with the base coating composition of Example 1 and  
RTV-668, respectively, and having ground quartz as a filler

each had a tear strength of 2 to 3 pounds. Samples which utilized calcium carbonate or hydrated alumina as a non-abrasive filler in accordance with the present invention each had a tear strength of 8 to 9 pounds. When treated fumed silica was employed as a non-abrasive filler the base fabric material exhibited a tear strength of 7 to 15 pounds.

(RTV 668 is described in Table I, Example No. 3 of United States Patent No. 3,436,366.)

TABLE II

<u>Sample</u>	<u>Base Coating</u>	<u>Filler</u>	<u>Tear Strength (lbs.)</u>
Glass	None	None	5
Cloth			
1	As in Ex. 1	Ground quartz	2-3
2	RTV-668	Ground quartz	2-3
3	As in Ex. 1	Calcium carbonate	8-9
4	As in Ex. 1	Hydrated alumina	8-9
5	As in Ex. 1	Hexamethyl disilazane treated fumed silica	7-15

Example 3

In order to show the improved flame retardance of the present invention the following samples were prepared with the results set out in Table III. A one-half inch by six inch piece of fiberglass fabric described in Example 2 above was coated as in Example 1. In the first sample the base polymer composition included 40 parts ground quartz filler, in the second sample 40 parts of calcium carbonate were included, and in the third sample 40 parts of hydrated alumina were added. The cured fabric membrane material was ignited, and the amount of the material consumed as well as the flame-glow time were measured.

The test used to determine the flammability of these materials consisted of having the 0.5''x6'' sample of the material under test in a glass tube (2''IDx6'' long). A bunsen burner with a 1.5 inch high soft blue flame is placed so that the lower 0.75'' of the test specimen is in the center of the flame. After the flame has been applied for 20 seconds, the burner is removed and the duration of burnings is timed. The percent of the sample consumed and burning (glowing) time in seconds is recorded.

TABLE III

<u>Sample</u>	<u>Filler</u>	<u>% Consumed</u>	<u>Flame-Glow Time (sec.)</u>
1	Ground quartz	100	90
2	Calcium carbonate	20	25
3	Hydrated alumina	25	43

Thus it can be seen that the inclusion of a non-abrasive filler in the base silicone coating composition significantly improves the flame retardance of the base fabric material.

-21-

CLAIMS

1. A method for imparting improved tear strength and improved flame retardance to a base fabric material comprising applying to at least one side of said base fabric material a base silicone coating composition containing an effective  
5 amount of non-abrasive filler.

2. The method of Claim 1 further comprising the step of applying to at least one side of said base fabric material coated with said base silicone coating composition a coating composition which is resistant to dirt pickup.

10 3. The method of Claim 1 or 2 wherein the base fabric material is made of a material selected from the group consisting of cotton, polyester, nylon and glass fabric.

4. The method of Claim 1 or 2 wherein the base fabric material is glass fabric.

15 5. The method of Claim 1 or 2 wherein the base fabric material is selected from the group consisting of laminated and reinforced plastics.

6. The method of Claim 1 or 2 wherein the base fabric material is fiberglass fabric.

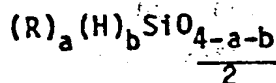
20 7. The method of Claim 1 or 2 wherein the base silicone coating composition is translucent.

8. The method of Claim 1 or 2 wherein the non-abrasive filler is selected from the group consisting of calcium carbonate, hydrated alumina, fumed silica, aluminum silicate, potassium titanate, zirconium silicate, carbon black, zinc oxide, titanium dioxide, ferric oxide, silica aerogel, precipitated silica, calcium silicate, chromic oxide, cadmium sulfide, lithopone, talc, magnesium oxide and graphite and mixtures thereof.
9. The method of Claim 1 or 2 wherein the amount of non-abrasive filler ranges from 5 to 300 parts by weight per 100 parts by weight polymer in the base silicone coating composition.
10. The method of Claim 1 or 2 wherein the amount of non-abrasive filler ranges from 20 to 100 parts by weight per 100 parts by weight polymer in the base silicone coating composition.
11. The method of Claim 1 or 2 wherein the amount of non-abrasive filler ranges from 50 to 100 parts by weight per 100 parts by weight polymer in the base silicone coating composition.
12. The method of Claim 1 or 2 wherein the non-abrasive filler is selected from the group consisting of calcium carbonate, hydrated alumina and fumed silica.
13. The method of Claim 2 wherein the dirt resistant coating composition comprises:

silicon atoms contain silicon-bonded vinyl groups, and where the ratio of  $(R^3)_3SiO_{0.5}$  units to  $SiO_2$  units is from about 0.5:1 to about 1:1 and the ratio of  $(R^3)_2SiO$  units to  $SiO_2$  units may range up to 0.1:1;

(c) a platinum catalyst; and

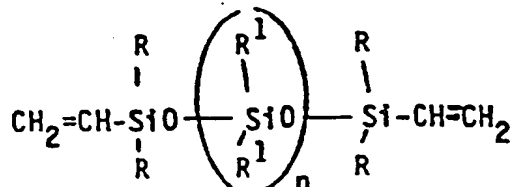
(d) a liquid organohydrogenpolysiloxane having the formula,



sufficient to provide from about 0.5 to about 1.0 silicon-bonded hydrogen atoms per silicon-bonded vinyl group, where R is as previously defined, a has a value of from about 1.0 to about 2.1, b has a value of from about 0.1 to about 1.0, and the sum of a and b is from about 2.0 to about 2.7, there being at least two silicon-bonded hydrogen atoms per molecule.

15. The method of Claim 2 wherein the dirt resistant coating comprises:

(a) 100 parts of a liquid vinyl chainstopped polysiloxane having the formula,



where R and  $R^1$  are monovalent hydrocarbon radicals free of aliphatic unsaturation with at least 50 mole percent of the  $R^1$  groups being methyl, and where n has a value sufficient to provide a viscosity of up to about 2,000,000 centipoise at 25°C;

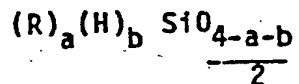
(b) 100-200 parts of a resinous organopolysiloxane copolymer selected from the group consisting of:

(i) resinous organopolysiloxane copolymer comprising  $(R^2)_3SiO_{0.5}$  units and  $SiO_2$  units, where  $R^2$  is selected from the group consisting of vinyl radicals and monovalent hydrocarbon radicals free of aliphatic unsaturation, where the ratio of  $(R^2)_3SiO_{0.5}$  units to  $SiO_2$  units is from about 0.5:1 to about 1:1, and where from about 1.5 to about 10 mole percent of the silicon atoms contain silicon-bonded vinyl groups; and

(ii) resinous organopolysiloxane copolymers comprising  $(R^3)_3SiO_{0.5}$  units,  $(R^3)_2SiO$  units and  $SiO_2$  units, where  $R^3$  is selected from the group consisting of vinyl radicals and monovalent hydrocarbon radicals free of aliphatic unsaturation, where from about 1.5 to about 10 mole percent of the silicon atoms contain silicon-bonded vinyl groups, and where the ratio of  $(R^3)_3SiO_{0.5}$  units to  $SiO_2$  units is from about 0.5:1 to about 1:1 and the ratio of  $(R^3)_2SiO$  units to  $SiO_2$  units may range up to 0.1:1;

(c) a platinum catalyst; and

(d) a liquid organohydrogenpolysiloxane having the formula,



5        sufficient to provide from about 0.5 to about 1.0  
silicon-bonded hydrogen atoms per silicon-bonded  
vinyl group, where R is as previously defined, a has  
a value of from about 1.0 to about 2.1, b has a  
value of from about 0.1 to about 1.0, and the sum of  
10       a and b is from about 2.0 to about 2.7, there being  
at least two silicon-bonded hydrogen atoms per  
molecule.

16. A method for imparting improved tear strength  
and improved flame retardance to a base fabric material  
15       comprising applying to at least one side of a base fabric  
material selected from the group consisting of cotton,  
polyester, nylon, glass fabric, laminated plastics and  
reinforced plastics a base silicone coating composition  
containing from 5 to 300 parts by weight of a non-abrasive  
20       filler selected from the group consisting of calcium carbonate,  
hydrated alumina, fumed silica, aluminum silicate, potassium  
titanate, zirconium silicate, carbon black, zinc oxide,  
titanium dioxide, ferric oxide, silica aerogel, precipitated  
silica, calcium silicate, chromic oxide, cadmium sulfide,  
25       1kthopone, talc, magnesium oxide and graphite and mixtures  
thereof, and optionally, applying to at least one side of said

base fabric material coated with said base silicone coating composition, a coating composition which is resistant to dirt pickup.

5           17. The method of Claim 16 wherein the base fabric material is fiberglass cloth and the silicone coating composition contains from 20 to 100 parts by weight per 100 parts by weight polymer in the base silicone coating composition of non-abrasive filler selected from the group consisting of calcium carbonate, hydrated alumina and fumed  
10       silica.

          18. A roofing fabric membrane structure having improved tear strength and flame retardance comprising:

(a) a base fabric material and

          (b) a silicone base coating composition having an  
15       effective amount of non-abrasive filler applied to at least one side of said base fabric material.

          19. The article of Claim 18 further comprising a coating composition which is resistant to dirt pickup.

          20. The article of Claim 18 wherein the base fabric  
20       material is selected from the group consisting of cotton, polyester, nylon, glass fabric, laminated plastics and reinforced plastics.

          21. The article of Claim 18 wherein the base fabric material is fiberglass fabric.

22. The article of Claim 18 wherein the base coating composition is a translucent or transparent silicone composition.

5 23. The article of Claim 18 wherein the non-abrasive filler is selected from the group consisting of calcium carbonate, hydrated alumina, fumed silica, aluminum silicate, potassium titanate, zirconium silicate, carbon black, zinc oxide, titanium dioxide, ferric oxide, silica aerogel, precipitated silica, calcium silicate, chromic oxide, cadmium sulfide,  
10 lithopone, talc, magnesium oxide and graphite and mixtures thereof.

24. The article of Claim 18 wherein the amount of non-abrasive filler ranges from 5 to 300 parts by weight per 100 parts by weight polymer in the base silicone coating  
15 composition.

25. The article of Claim 18 wherein the amount of non-abrasive filler ranges from 20 to 100 parts by weight per 100 parts by weight polymer in the base silicone coating composition.

20 26. The article of Claim 18 wherein the non-abrasive filler is selected from the group consisting of calcium carbonate, hydrated alumina and fumed silica.